

Yield and Economic Advantage of Groundnut - Millets Intercropping System

Keywords: Foxtailmillet, Fingermillet, Groundnut, Prosomillet of millets with groundnut and Prosomillet.

Agricultural production has to increase to meet the expected demands of food and feed for the world's fast growing population. This additional production has to come from existing cultivated area. Under the given situation of diversion of agricultural land for non-agricultural purpose, climate change and limited scope of extensive agriculture is making this task more difficult. The best alternative available is utilization of time and space in agriculture through intensification and diversification. This includes relay cropping, crop rotation and intercropping of major crops with other compatible crops. However, several elements like seeding ratios, planting pattern, cultivar and competition between mixture components affect the choice as well as growth of species in intercropping (Carr *et al.*, 2004).

Intercropping is referred as biological insurance as it reduces the risk in agriculture to some extent by growing two or more crops in the same field at same time or in same crop season by exploiting resources better than when the crops are grown separately. Success of intercropping system depends upon types of intercrops and also the spatial arrangement which affects productivity, competition and nutrient uptake.

Intercropping groundnut with rapidly growing short duration crops like millets would prove to be a viable intercropping system. It provides good profits through efficient use of land, solar energy and water besides assuring insurance against crop failure and offers good scope for stability in production. Having deep root system, legumes can extract moisture and nutrients from deeper layer and hence does not compete with associated cereals. Apart from fixing nitrogen in soil, a part of fixed nitrogen is also spared for the cereal intercropped and hence enhance crop growth even in the nitrogen deficient soil. In this context, the present investigation was undertaken to study the yield and economic advantage of groundnut+millets intercropping system in Krishna agro-climatic zone of Andhra Pradesh

A field experiment was conducted at Agricultural College Farm, Bapatla during *kharij*, 2019 to study the yield and economic advantage of

groundnut+millets intercropping system. The experimental soil is sandy in texture, neutral in reaction, low in available nitrogen, medium in available phosphorous and high in available potassium. The experiment was laid out in randomized block design comprising of three intercrops *viz.* foxtailmillet (Narasimharaya), fingermillet (Srichaitanya) and prosomillet (PMNDL-2) with groundnut (Kadiri-9) in 8:1 and 7:2 row proportion and their solecrops replicated thrice. The treatments included in the experiment were T₁: Groundnut + Foxtailmillet (7:2), T₂: Groundnut + Foxtailmillet (8:1), T₃: Groundnut + Fingermillet (7:2), T₄: Groundnut + Fingermillet (8:1), T₅: Groundnut + Prosomillet (7:2), T₆: Groundnut + Prosomillet (8:1), T₇: Sole crop of Groundnut, T₈: Sole crop of Foxtailmillet, T₉: Sole crop of Fingermillet, T₁₀: Sole crop of Prosomillet. All the crops were fertilized at their recommended dose and area occupied by them and efficient plant protection measures were taken as and when required.

Yield of groundnut

Significantly higher pod yield and haulm yield of groundnut was recorded in sole crop of groundnut compared to any other intercropping systems. This might be attributed to higher and optimum plant densities and lower competition environment in sole cropping compared to intercropping system. Similar results were reported by Shwethanjali *et al.*, (2018), Bhuva *et al.*, (2017) and Shivaraj (2015). Among intercropping systems, groundnut+foxtailmillet (8:1) recorded higher pod yield (1949 kg ha⁻¹) which was on par with groundnut+prosomillet (1890 kg ha⁻¹) and groundnut+fingermillet (1748 kg ha⁻¹) at 8:1 row proportion and sole groundnut (2045 kg ha⁻¹). Groundnut intercropped with foxtailmillet at 8:1 row ratio recorded higher haulm yield (2742 kg ha⁻¹) followed by groundnut intercropped with prosomillet (2562 kg ha⁻¹) at same row ratio which were on par with sole groundnut (2757 kg ha⁻¹). This could be due to higher groundnutpod yield combined with efficient utilisation of resources along with millets in the intercropping system. These results were in accordance with Shwethanjali *et al.*, (2018).

Table 1. Yield of groundnut and millets as influenced by groundnut+millets intercropping system

Treatments	Groundnut		Millets		Groundnut pod equivalent yield (Kg ha ⁻¹)
	Pod yield (kg ha ⁻¹)	Haulm yield (kg ha ⁻¹)	Grain yield (kg ha ⁻¹)	Straw yield (kg ha ⁻¹)	
T ₁ - Groundnut + Foxtailmillet (7:2)	1674	2435	459	636	1865
T ₂ - Groundnut + Foxtailmillet (8:1)	1949	2742	285	318	2068
T ₃ - Groundnut + Fingermillet (7:2)	1497	2225	639	742	1869
T ₄ - Groundnut + Fingermillet (8:1)	1748	2483	424	493	1995
T ₅ - Groundnut + Prosomillet (7:2)	1543	2272	397	486	1709
T ₆ - Groundnut + Prosomillet (8:1)	1890	2562	211	317	1978
T ₇ - Sole crop of Groundnut	2045	2757	-	-	2045
T ₈ - Sole crop of Foxtailmillet	-	-	1454	1715	606
T ₉ - Sole crop of Fingermillet	-	-	1968	2308	1148
T ₁₀ - Sole crop of Prosomillet	-	-	1088	1394	453
S.Em ±	111	111	39	59	66
CD (P=0.05)	343	342	116	175	195
CV(%)	10.9	7.7	9.8	12.1	7.2

Table 2. Economic advantage of groundnut+millets intercropping system

Treatments	Cost of cultivation (Rs. ha ⁻¹)	Gross returns (Rs. ha ⁻¹)	Net returns (Rs. ha ⁻¹)	B:C ratio (Rs.)	Monetary advantage index (Rs.)
T ₁ - Groundnut + Foxtailmillet (7:2)	42407	89528	47121	2.11	10301
T ₂ - Groundnut + Foxtailmillet (8:1)	44409	98292	53883	2.21	12740
T ₃ - Groundnut + Fingermillet (7:2)	42988	89723	46735	2.09	4776
T ₄ - Groundnut + Fingermillet (8:1)	44849	95783	50934	2.14	6269
T ₅ - Groundnut + Prosomillet (7:2)	42757	82020	39263	1.92	9092
T ₆ - Groundnut + Prosomillet (8:1)	44733	94924	50191	2.12	10006
T ₇ - Sole crop of Groundnut	46110	100256	54146	2.17	-
T ₈ - Sole crop of Foxtailmillet	19997	26172	6175	1.31	-
T ₉ - Sole crop of Fingermillet	26961	55113	28152	2.04	-
T ₁₀ - Sole crop of Prosomillet	17620	21760	4140	1.23	-

Yield of millets

Grain and straw yield of millets was reduced in both the row ratios of intercropping system than in sole cropping. Higher yields recorded under sole cropping could be due to no inter specific competition from other species except intra competition compared to intercropping system and 100 per cent plant population. Competition offered by groundnut for natural resources also resulted in poor development of millets in intercropping system. Among intercropping treatments, groundnut + millets intercropping at 7:2 row

ratio recorded higher grain and straw yield as compared to 8:1 row ratio which might be mainly due to an extra row of millets, more available space between two millets rows with better availability of light, efficient utilisation of resources and favourable intra and inter species competition, which resulted in higher yield attributing parameters and had a possible influence on yield. These results were in agreement with studies of Shwethanjali *et al.*, (2018), Manjunath and Salakinkop (2017) and Mahto *et al.*, (2007).

Groundnut pod equivalent weight

In order to express the yield advantage, the yields of individual intercrops were converted into equivalent yield of main crop based on prevailing market price. Among the intercropping system tested, significantly higher Groundnut Pod Equivalent Yield (GPEY) was recorded in groundnut + foxtailmillet (2068 kg ha⁻¹) in 8:1 row ratio due to additional advantage of foxtailmillet yield and higher groundnut yield along with intercrop due to better complementary relationship. However, it was statistically on par with sole groundnut (2045 kg ha⁻¹), intercropping of prosomillet and fingermillet with groundnut (1978 and 1995 kg ha⁻¹, respectively) in 8:1 row ratio. The difference in groundnut pod equivalent weight might be due to differences in the yield of groundnut, component crop yield and price of individual component crops. The results obtained in the present study are in agreement with the studies conducted by Shwethanjali *et al.* (2018) and Manjunath and Salakinkop (2017).

Economics

Among the different treatments, sole groundnut recorded higher gross returns (Rs.1,00,256 ha⁻¹) and net returns (Rs.54,146 ha⁻¹) closely followed groundnut + foxtail millet at 8:1 row ratio (Rs. 98,292 ha⁻¹ and 53,883 ha⁻¹, respectively). This was mainly due to higher price and yield of groundnut. These results were in accordance with findings of Shivaraj (2015). However, intercropping of groundnut with foxtail millet noticed higher B:C ratio (2.21) followed by fingermillet and prosomillet (2.14 and 2.12, respectively) at 8:1 row ratio. Moreover, higher monetary advantage index was also noticed in groundnut+foxtailmillet at 8:1 row ratio (Rs. 12,740). On the other hand, lower B:C ratio (1.23) was noticed with sole prosomillet. The above findings are in conformity with Shwethanjali *et al.* (2018).

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CONCLUSION

Thus it can be concluded that intercropping of groundnut + foxtailmillet in 8:1 row ratio is found to be biologically and economically sustainable intercropping system.

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